HXS Static Test Plan

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HXS Operating Modes

The static (off-line) testing includes the simulation and verification of the six instrument modes:
1. Wake-Up activation and self tests
2. Ready-for-Shot handshakes
3. Shot (data collection)
4. Readout-of-Data
5. Shutdown
6. Sleep

Wake-Up Mode is activated when digital commands are sent to the HXS Drive Electronics (DE) via the data in/out SMA fiber optic cable from the Diagnostic Control Processor (DCP) laptop computer. The DE responds with self-test information. If the self test is satisfactory, the DE responds with a **Ready-for-Shot** handshake.

When the **Ready-for-Shot Mode** is initiated, the CCD detector will be in the **Sleep Mode**. The **Sleep Mode** is implemented because of the large power drain (~750 mA) during the CCD clearing operation.

Shot Mode is initiated by the LLE T_o–10 second diagnostic trigger pulse. The T_o–10 second pulse is sent by LLE on a 50 ohm coax BNC that is connected to the Diagnostic Interface Unit (DIU). The DIU command triggers a fiber optic transmitter, which sends a light pulse via the SMA fiber optic cable. The HXS instrument utilizes the existing fiber optic cables that are already contained in the TIM umbilical, which we term the trigger fiber optic and the data fiber optic.

The trigger activation pulse of the trigger fiber optic initiates the CCD detector's clearing operation which clears the residual charge. The trigger fiber optic pulse also starts a countdown timer, inside the DE, that will trigger the CCD detector ~300ms before T_o. The integration time of the CCD detector will be ~600ms. The x-ray data image is acquired by the CCD driver board and transmitted via the data fiber optic to the DCP.

Shutdown Mode occurs after the x-ray data image has been received by the LLE DAS. The HXS instrument remains in the **Shutdown Mode** until commanded by the DCP. If left unused for a 12 hour period, the instrument transitions to the **Sleep Mode**. Once in the **Sleep Mode**, the instrument requires the removal and reconnection of the right-angle 25 pin D-sub male connector cable from the Internal Battery Pack (IBP) to return to the **Shutdown Mode**.

Initial Setup

The operator opens the shipping case and connects the two SMA fiber optic cables in the following manner: (1) The data in/out SMA fiber optic connects to the Diagnostic Control Processor (DCP) laptop computer. (2) The trigger SMA fiber optic connects to the TIM Diagnostic Interface Unit (DIU).

Connect the right-angle 25 pin D-sub male connector cable to the Internal Battery Pack (IBP). This action initiates the instrument's **Shutdown Mode**.

If there is no activity to the instrument for a 12 hour period, it will transition to the **Sleep Mode**. Suspension of the **Sleep Mode** requires the removal and reconnection of the right-angle 25 pin D-sub male connector cable from the Internal Battery Pack (IBP). This action initiates the **Shutdown Mode**.

Simulation of Data Transfer to the OMEGA DAS:

The DCP is connected to the OMEGA DAS via an Ethernet cable made available by LLE for off-line testing. The LLE DAS will conduct a normal shot sequence with the HXS instrument riding along off-line. The handshake commands are tested, and the LLE T_o-10 second trigger pulse is routed by LLE to the off-line testing area. The HXS instrument records an integrated (dark) exposure on the CCD detector with the normal integration time. Based on experience with the CCD, the dark image has a background level that is easily recognized and serves to verify the data transfer system.

Although experience with the HXS CCD indicates that the dark image can serve to test the data acquisition system, an additional test can be performed if required. A backup test CCD sensor with a known test pattern that is positioned just above the CCD is installed into the instrument's CCD assembly. The test CCD has a transient LED light source integrated into the CCD package. The test CCD is triggered by the LLE T_o–10 second trigger pulse, and the LED is activated at T_o. The test CCD image is acquired by the DE and is sent via the data fiber optic to the DCP.